MAT 1341D Test 1

v1

Winter 08

February 14th

Instructor: Charles Starling

Family Name:______________________

First Name:_______________________

Student Number: __________________

Question	Response	Points
1		
2		
3		
4		
5		
6	–	
7	–	
Total	–	

PLEASE READ THESE INSTRUCTIONS VERY CAREFULLY.

1. You have 90 minutes to complete this exam.
2. This is a closed book exam, and no notes of any kind are allowed. **Do not use your own scrap paper! Use the last page or the backs of pages for rough work**.
3. The use of calculators, cell phones, pagers or any text storage or communication device is not permitted.
4. Questions 1 through 5 are multiple choice. They are worth 2 points each and no part marks will be given. Please record your answers in the space provided above.
5. Questions 6 and 7 require a complete solution, and are worth 6 points each, so spend your time accordingly. **The correct answer requires justifcation written legibly and logically: you must convince me that you know why your solution is correct. You must answer these questions in the space provided.** Use the backs of pages if necessary.
6. Where it is possible to check your work, do so.
7. Good luck! Bonne chance!

1. If $\begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = 5$, find $\begin{vmatrix} 3g & a & d-5a \\ 3h & b & e-5b \\ 3i & c & f-5c \end{vmatrix}$.

A. 15
B. -15
C. 75
D. -75
E. 25
F. -25

2. For a non-homogeneous system of 40 equations in 9 unknowns, answer the following three questions:

- Can the system be inconsistent?
- Can the system have a unique solution?
- Can the system have infinitely many solutions?

A. Yes, No, No.
B. Yes, Yes, No.
C. Yes, No, Yes.
D. Yes, Yes, Yes.
E. No, Yes, Yes.
F. No, No, No.

3. If $B = \begin{bmatrix} 1 & 1 & -1 \\ 0 & 1 & 1 \\ 0 & 0 & i \end{bmatrix}$, then the second row of B^{-1} is

A. $[i, 1, -1]$

B. $[-1, 1, 0]$

C. $[0, 1, i]$

D. $[1, -1, i]$

E. $[0, 1, -i]$

F. None of the above.

4. What are the eigenvalues of $\begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$?

A. 1 and 2.

B. 1 only.

C. -1 and -4.

D. 1 and 4.

E. -1 and 4.

F. None of the above.

5. Find $\mathrm{Im}(z)$ if

$$z = \frac{3+2i}{1+i}.$$

A. $\frac{5}{2}$

B. $-\frac{1}{2}$

C. 5

D. $\frac{1}{2}$

E. 2

F. None of the above.

6. Suppose $c, d \in \mathbb{R}$ and consider the following system in the unknowns x, y and z:

$$\begin{array}{rcrcrcr} x & & & + & z & = & -2 \\ x & + & y & + & & = & 0 \\ 3x & + & y & + & cz & = & d \end{array}$$

a) If $[A \mid b]$ is the augmented matrix of the system above, find $\operatorname{rank}(A)$ and $\operatorname{rank}([A \mid b])$ for all values of c and d.

b) Using part (a), find all values of c and d so that this system has:

- a unique solution,
- infinitely many solutions, and
- no solutions.

7. State whether the following are true or false and justify your answer.

i) The matrix $\begin{bmatrix} 2 & 1 \\ 0 & 2 \end{bmatrix}$ is diagonalizable.

ii) If A and B are square matrices such that AB is invertible, then A is invertible.

iii) A 2×2 linear system of equations is always consistent.

iv) Suppose that A is invertible and that $AC = CA$. Then $A^{-1}C = CA^{-1}$.

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